



# Garrett James Blair, PhD

New York University, Center for Neural Science, Fenton Lab

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## Education

**Undergraduate: University of California, Irvine** (September 2011 – June 2015)

B.S. in Cognitive Science, emphasis in Cognitive Neuroscience, (*Magna Cum Laude*)

B.A. in Spanish, emphasis in Literature and Culture, B.A. (*Cum Laude*)

**Graduate: University of California, Los Angeles** (September 2015 – December 2021)

M.A. in Psychology

- March 2017

PhD in Psychology, major in Behavioral Neuroscience

- December 2021

Graduate advisor: Hugh Tad Blair, PhD

Dissertation title: *Calcium Imaging of Cortical and Hippocampal Neurons During Learning and Decision Making*

## Current Research

**Postdoctoral Researcher: New York University, Center for Neural Science** (November 2021-present)

Advisor: André Fenton, PhD, Neurobiology of Cognition Lab - [www.fentonlab.com](http://www.fentonlab.com)

Research focus: Coordination of information across brain regions

Methods: In-vivo single-photon calcium imaging and electrophysiology in rats

I utilize multimodal neural recording approaches to investigate how information is coordinated across various brain regions (including the hippocampus, medial entorhinal cortex, and anterior cingulate cortex) during spatial avoidance and decision-making tasks. This allows us to understand in what ways the brain organizes relevant task demands, and how these are affected in animal models of developmental disorders.

## Previous Research

**University of California, Los Angeles** (September 2015 – December 2021)

In Dr. Tad Blair's lab (no relation), I sought to study the long-term population dynamics of hippocampal place cells. This initially began by recording electrophysiological signals when I joined the lab, but eventually I adopted calcium imaging due to its capability to record the same population for much longer periods of time. I adapted and developed this novel technique to use in rats, as well as assisting with the prototyping of a novel large field of view Miniscope ("MiniLFOV") in collaboration with Dr. Aharoni's lab. Using this technique, I evaluated how cholinergic activity is needed for reorganizing a memory engram during aversive learning.

**University of California, Irvine** (June 2013 – June 2015)

Research in Chubb-Wright Lab, human visual psychophysics research; senior honors thesis studied if an object's size can be used as a pre-attentive visual filtering mechanism.

**University of California, Irvine** (January 2014 – September 2014)

Research with Professor D'Zmura, brain-computer interface using EEG studying the effects of virtual reality immersion during self-motion vestibular mismatch.

## Awards and Honors

### Academic and Professional Honors

2011-2015

University of California, Irvine Dean's Honor List

2011-2015

University of California, Irvine Campuswide Honors Program

2015

Undergraduate Research Opportunities Program fellowship

2015

Cognitive Science (BS) Magna Cum Laude

2015

Spanish Literature and Culture (BA) Cum Laude

2015

UCLA Alumni Fellowship

2016

UCLA Graduate Research Summer Mentorship award

2016

UCLA-PKU Joint Research Inst. Award

2016

UCLA Brain Research Inst. Grad. Student Travel Award

### Memberships and Professional Activities

Vision Science Society (2015)

Society for Neuroscience (2016-current)

## Publications

- G.J. Blair**, C. Guo, M.S. Fanselow, P. Golshani, D.B. Aharoni, H.T. Blair. (in prep) *Muscarinic acetylcholine activity is necessary for learning to induce remapping of hippocampal place cells.*
- G.J. Blair\***, C. Guo\*, M. Seghal, F.N.S. Jimka, A. Bellafard, A.J. Silva, P. Golshani, M.A. Basso, H.T. Blair, D.B. Aharoni (under rev.) *Miniscope-LFOV: A large field of view, single cell resolution, miniature microscope for wired and wire-free imaging of neural dynamics in freely behaving animals* DOI: <https://doi.org/10.1101/2021.11.21.469394v1>
- G.J. Blair\***, E.E. Hart\*, T.J. O'Dell, H.T. Blair, A. Izquierdo. *Chemogenetic modulation and single-photon calcium imaging in anterior cingulate cortex reveal a mechanism for effort-based decisions.* Journal of Neuroscience, 15 July 2020, 40 (29) 5628-5643; DOI: <https://doi.org/10.1523/JNEUROSCI.2548-19.2020>
- P.J. Schuette, F.M.C.V. Reis, S.M. Pereira, M.H. Chakerian, A. Torossian, **G.J. Blair**, W. Wang, H.T. Blair, J.C. Kao, A. Adhikari. *Long-term characterization of hippocampal remapping during contextual fear acquisition and extinction.* Journal of Neuroscience, 21 October 2020, 40 (43) 8329-8342; DOI: <https://doi.org/10.1523/JNEUROSCI.1022-20.2020>
- Z. Chen, **G.J. Blair**, H.T. Blair, J. Cong. *CANSEE: Customized Accelerator for Neural Signal Enhancement and Extraction from the Calcium Image in Real Time.* FPGA 2020: 318; DOI: <https://doi.org/10.1145/3373087.3375358>
- Z. Chen, **G.J. Blair**, H.T. Blair, J. Cong. *BLINK: bit-sparse LSTM inference kernel enabling efficient calcium trace extraction for neurofeedback devices.* ISLPED 2020: 217-222; DOI: <https://doi.org/10.1145/3370748.3406552>

\* co-first author

## Presentations and Invited Lectures

- Z. Chen\*, **G. J. Blair**, H. T. Blair, and J. Cong. *BLINK: Bit-Sparse LSTM Inference Kernel Enabling Efficient Calcium Trace Extraction for Neurofeedback Devices.* International Symposium on Low Power Electronics and Design (ISLPED). 2020, Boston, USA. Aug. 10th. [**Poster & Abstract in Proceedings**]
- Z. Chen\*, **G. J. Blair**, D. Aharoni, P. Golshani, J. Cong, and H. T. Blair. *Calcium Image Processing for Energy-Efficient Closed-Loop Neurofeedback in Sub-ms Latency.* 6th Annual BRAIN Initiative Investigators Meeting, 2020, Jun. 1st [**Poster**]
- Z. Chen\*, **G. J. Blair**, H. T. Blair, and J. Cong. *Acceleration of Calcium Imaging Processing Pipeline for the UCLA Miniscope Project.* CDSC/InTrans Review. 2020, UCLA. Feb. 27th [**Poster**]
- Z. Chen\*, **G. J. Blair**, R. Seow, H. T. Blair, and J. Cong. *CANSEE: Customized Accelerator for Neural Signal Enhancement and Extraction from the Calcium Image in Real Time.* International Symposium on Field-Programmable Gate Arrays (FPGA), 2020, Seaside, USA. Feb. 23<sup>rd</sup> [**Poster & Abstract in Proceedings**]
- Blair, GJ\*** *Utilizing the next generation of miniature endoscopes to probe hippocampal function.* Knierim Lab, John's Hopkins University, 2019, Baltimore, USA. Nov. 6<sup>th</sup> [**Invited Lecture**]
- Z. Chen\*, **G. J. Blair**, D. Aharoni, P. Golshani, J. Cong, and H. T. Blair. *FPGA-Based Real-Time Processing of Integrated Electrophysiology and Calcium Imaging with the UCLA Miniscope.* Neuroscience 2019 Annual Meeting. Chicago, USA. Oct. 19<sup>th</sup>. [**Poster**]
- Blair, GJ\***, Howe, AG, Golshani, P, & Blair, HT (2018) *Long-term population recordings of hippocampal place cells via Ca2+ imaging in the rat.* UCI Learning and Memory 2018 conference. [**Poster**]
- Hart, EE\*, **Blair, GJ**, Blair, HT, Izquierdo, A (2018) *Mediation of Effort-Based Choice and Miniaturized Fluorescence Microscopy Calcium Imaging in Rat Anterior Cingulate Cortex.* Neuroscience 2018 Annual Meeting. [**Poster**]
- Blair, GJ\***, Howe, AG, Aharoni, D, Flores, S, Shuman, T, Golshani, P, & Blair, HT (2016) *Calcium Imaging of Hippocampal Cell Activity in Behaving Rats.* Neuroscience 2016 Annual Meeting. [**Poster**]
- Howe AG\*, DeGuzman RM, **Blair GJ**, Blair HT (2016) *Place Cells in the Septohippocampal Nucleus of Freely Behaving Rats.* Society for Neuroscience 2016 meeting, San Diego, CA. [**Poster**]

	<p><b>Blair GJ*</b>, Wright CE, Chubb C, Sun P, Sperling G (2015). <i>Disc size supports top-down, selective attention in a task requiring integration across multiple targets</i>. Journal of Vision 15(12):897. <b>[Poster &amp; Abstract in Proceedings]</b> DOI:10.1167/15.12.897.</p> <p>*presenting speaker</p>
<b>Research Skills</b>	<ul style="list-style-type: none"> <li>➤ MATLAB and Python programming, primarily for calcium imaging (motion correction, cell segmentation, cross day matching) and behavioral analysis</li> <li>➤ Single-cell and population level analysis of spatial tuning, decoding, and event-related responses</li> <li>➤ Taught multiple labs surgical and analysis techniques involved in calcium imaging (Izquierdo, Adhikari, Kneirim, Fenton)</li> <li>➤ Hippocampal calcium imaging, electrophysiology (single-unit and EEG), and inhibitory DREADDs techniques</li> <li>➤ Perfusion, histology, and imaging procedures</li> <li>➤ Fluent in Spanish and basic knowledge of French</li> </ul>
<b>Academic contributions</b>	<p><b>Development of a miniscope teaching module for undergraduates</b></p> <p>During Spring quarter of 2019, while I was serving as a teaching assistant for Dr. William Grisham and Dr. Hugh T. Blair, I led the development and implementation of a “miniscope imaging” teaching module. This was a three week course during which students of the Psych 116 behavioral neuroscience course learned how to construct and use miniature endoscopic microscopes (“miniscopes”) within an actual experiment that took place in their classroom. This gave approximately 200 students hands-on experience with cutting edge neuroscience research tools developed at UCLA. We also performed analysis of that data with the students to show them how we can leverage these tools to address hypotheses about brain function.</p> <p>Student reviews of the course were overwhelmingly positive:</p> <p>“I very much appreciated having Garrett as a TA for this class. When asked a question, he knew the answer; however he was always able to explain the answer in "plain English" making the information easy to understand. In addition to this, he was very helpful in trouble shooting problems that came up during lab especially with computer software and coding. He always seemed to be a solid go-to for clarification or leading you to the next step. Having him as a TA likely made lab easier than it would have been otherwise.”</p>
<b>Teaching experience</b>	<p><b>Behavioral Neuroscience Lab. Psychology 116</b> – Spring 2020, Prof. Grisham (50%, 2 three-hour lab sections)</p> <p><b>Behavioral Neuroscience Lab. Psychology 116</b> – Spring 2019, Prof. Grisham (50%, 2 three-hour lab sections)</p> <p><b>Behavioral Neuroscience Lab. Psychology 116</b> – Fall 2016, Prof. Grisham (50%, 2 three-hour lab sections)</p> <p><b>Behavioral Neuroscience. Psychology 115</b> – Fall 2016, Prof. Schein (50%, 4 one-hour discussion sections)</p> <p><b>Research Methods in Psychology. Psychology 100B</b> – Winter 2017, Prof. Fristenburg (50% 2 two-hour discussion sections)</p>